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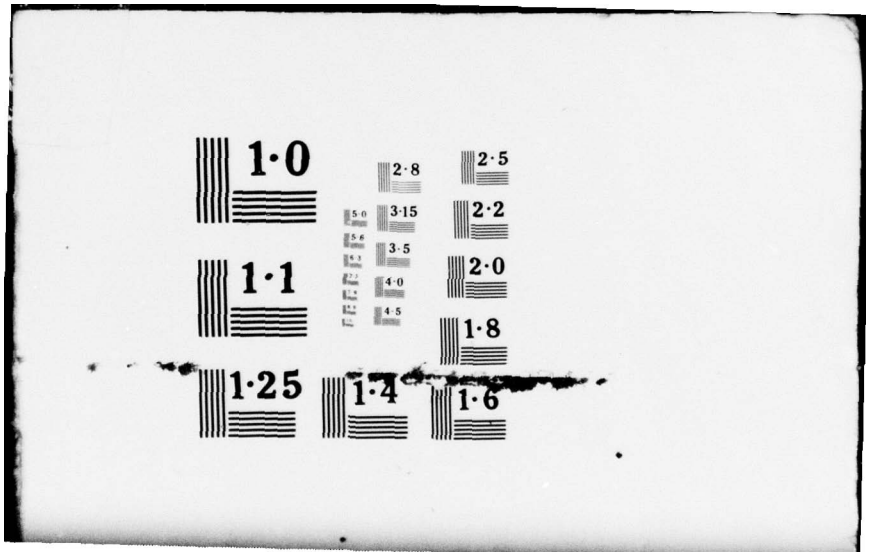
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LEVEL II

1842 EEG/EETD TR 78-14

AFCS TECHNICAL REPORT

AIR NATIONAL GUARD DEDICATED TRAINING CIRCUITS

DIGITAL AND NARROWBAND SYSTEMS BRANCH
1842 ELECTRONICS ENGINEERING GROUP (AFCS)
SCOTT AIR FORCE BASE, IL 62225

409646

15 SEPTEMBER 1978

1842 ELECTRONICS ENGINEERING GROUP

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~~1842 EEG~~ was tasked to select the most economical method of providing dedicated training circuits for Air National Guard tactical control and combat communications groups, 1842 EEG was tasked.

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APPROVAL PAGE

This report has been reviewed and is approved for publication and distribution.

ZYGMUND J. BARA
1842 EEG/EET (AFCS)
Chief, Command Control and Defense Communication Systems Engineering Division

JESSE J. TALLMAN, P.E.
1842 EEG/EETD (AFCS)
Chief, Digital/Narrowband Systems Branch

CHARLES L. SANDERS
1842 EEG/EETDD (AFCS)
Technical Area Manager, Digital Systems

ROY D. WHITE
1842 EEG/EETDD (AFCS)
Electronics Engineer

SUMMARY

Federal Court decisions made in 1977 preclude new TELPAK service to provide dedicated training circuits for Air National Guard Tactical Control and Combat Communications Groups. Costs of providing service for a small number of users were compared. Point-to-point service was the most expensive, small-net cost was the next most expensive, and large-net cost was the cheapest. Large-net costs for inter-connecting three Tactical Control Groups and six Combat Communications Groups were then determined. These large nets can provide from one to four encrypted teletype circuits for training; the National Guard Bureau has determined that one (1) teletype circuit will be sufficient.

ABBREVIATIONS/ACRONYMS

AFCH	Air Force Component Headquarters (Squadron)
CCF	Combat Communications Flight
CCG	Combat Communications Group
CCS	Combat Communications Squadron
CONT	Contingency (Squadron)
CRC	Control and Reporting Center
CRP	Control and Reporting Post
DASC	Direct Air Support Center
FACP	Forward Air Control Post
TAB	Tactical Air Base (Squadron)
TCF	Tactical Control Flight
TCG	Tactical Control Group
TCS	Tactical Control Squadron
TACC	Tactical Air Control Center

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1. INTRODUCTION. This report outlines the factors involved in selecting the most economical method of providing dedicated training circuits for Air National Guard (ANG) Tactical Control and Combat Communications Groups. Since Federal Court decisions made in mid-1977 preclude any TELPAK service to any new Air National Guard subscribers, it is entirely possible that present TELPAK service will be discontinued within a year.

1.1 The Problem. The 1842 EEG was tasked to consider alternative methods of communication available and determine the most economical method of providing dedicated training circuits for ANG Tactical Control and Combat Communications units.*

1.2 Factors Bearing On The Problem.

1.2.1 Circuits must be capable of handling both voice and teletype traffic.

1.2.2 Units are dispersed throughout CONUS and Hawaii.

1.2.3 The 281st Combat Communications Group is not equipped with teletype/crypto vans and was therefore not included in the network study.

1.2.4 Since only one unit of the 201st Combat Communications Group is equipped with teletype/crypto, and 201 CCG is located in Hawaii, it was not included in the network study.

1.2.5 Tactical Control-Combat Communications Group interaction must be provided.

1.2.6 On-line encryption of teletype circuits is required to allow cryptographic maintenance personnel to maintain their proficiency.

1.2.7 Air National Guard units train one weekend each month of the year.

1.2.8 Administrative Data Communications between many ANG units and Air Force Logistics Command (AFLC) bases are provided by SET 8 Interconnections, while Administrative Telephone Service is provided by AUTOVON direct lines and "drops" from AUTOVON-equipped switchboards. (Note: Some of these circuits were included in the request for this engineering evaluation and should not be considered as part of the circuits for systems training.)

1.2.9 Present organizational KW-7 cryptographic equipment is not compatible with SET 8, AUTODIN I or II centers; dedicated circuits are required by the National Guard Bureau.

2. ASSUMPTIONS.

2.1 Interaction Provision. Interaction between Tactical Control and Combat Communications Groups can be provided most economically by the following connections:

*ANG ltr 1 August 1977, Subject: SETA Contract.

2.1.1 152 TCG connected to 251 and 253 CCG.

2.1.2 154 TCG connected to 162 and 252 CCG.

2.1.3 157 TCG connected to 226 and 254 CCG.

2.2 Equipment Comparison. A voice telephone channel can provide both voice and teletype service simultaneously by using frequency shift keying equipment; the AN/TCC-29 provides one teletype channel, whereas other commercial equipment can provide up to four teletype channels. The cost of a dual-use voice/teletype channel would obviously be less than the cost of separate voice and teletype channels. The cost of each AN/TCC-29 is $463, while the cost of the commercial equipment for additional teletype channels would depend upon the number required.

3. ALTERNATIVES CONSIDERED.

3.1 Full-Period, Point-to-Point.

3.2 Full-Period, Small-Net (within tactical control group).

3.3 Full-Period, Large-Net (within tactical control group).

The cost comparison of full-period circuits using the three alternative types of interconnections between the 152 TCG with the 251 and 253 CCGs is listed below in Table 3-1.

TABLE 3-1. COST COMPARISON OF THE THREE ALTERNATIVE INTERCONNECTIONS

	Monthly Charges	Annual Charges	One-time Installation	Total First Year
Point-toPoint (Figure 3-1)	$2801.08	$33,612.96	$758.10	$34,371.06 (Table 3-2)
Small Net (Figure 3-2)	2487.15	29,845.80	758.10	30,603.90 (Table 3-3)
Large Net (Figure 3-3)	2386.91	28,642.92	758.10	29,401.02 (Table 3-4)

4. CONCLUSIONS. Since the large net (within the Tactical Control Group) method was determined to be the most economical means of interconnecting the Tactical Control and Combat Communications Groups, this method was used to compute costs for the entire training network (Figures 4-1, 4-2 and 4-3, also Table 4-1). The National Guard Bureau determined that single channel circuitry, with a capacity of 108,000 words of traffic during each month drill period would be sufficient. Total costs, premised on this determination, are as follows:

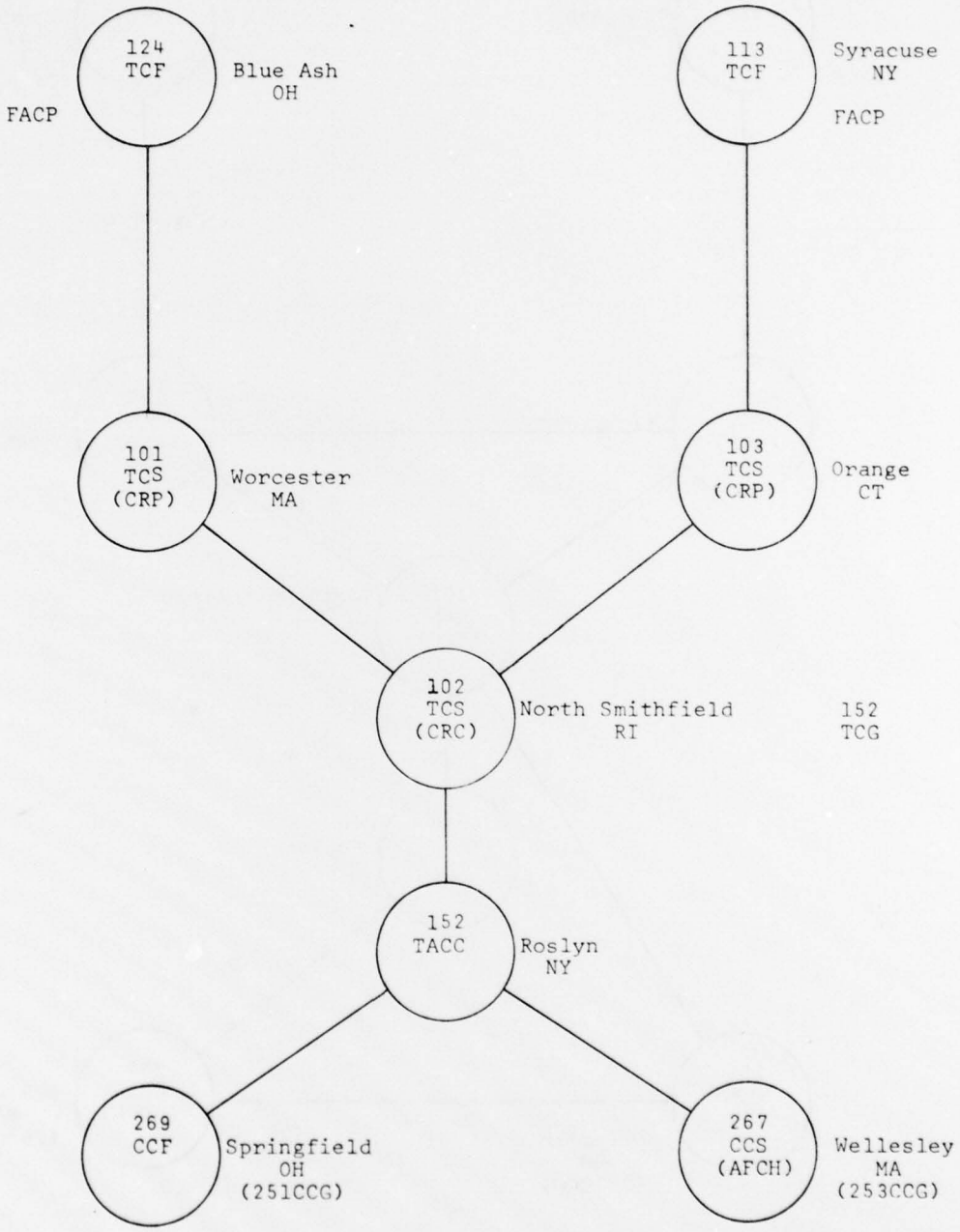


FIGURE 3-1. POINT-TO-POINT

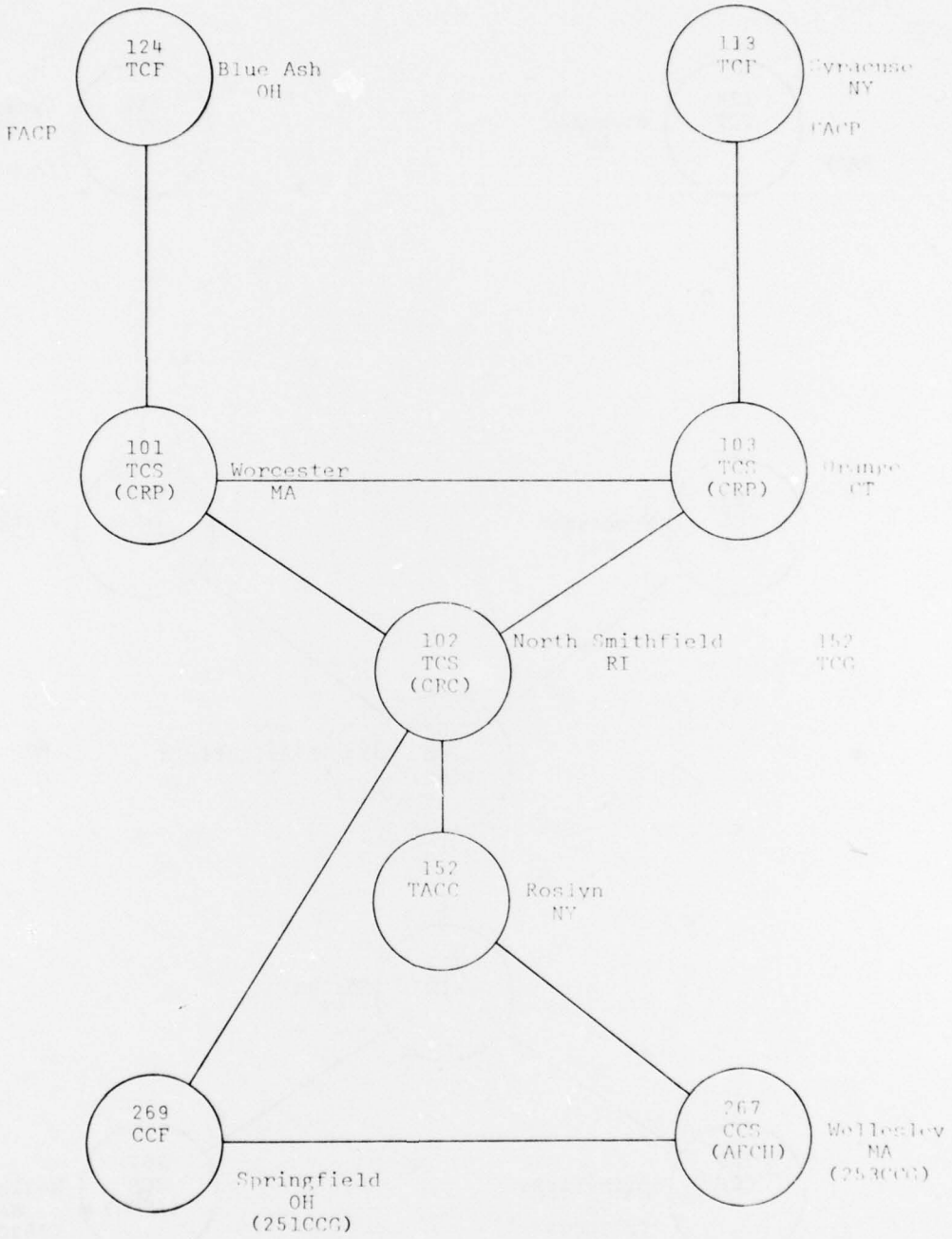


FIGURE 3-2. SMALL NET (TACTICAL CONTROL GROUP)

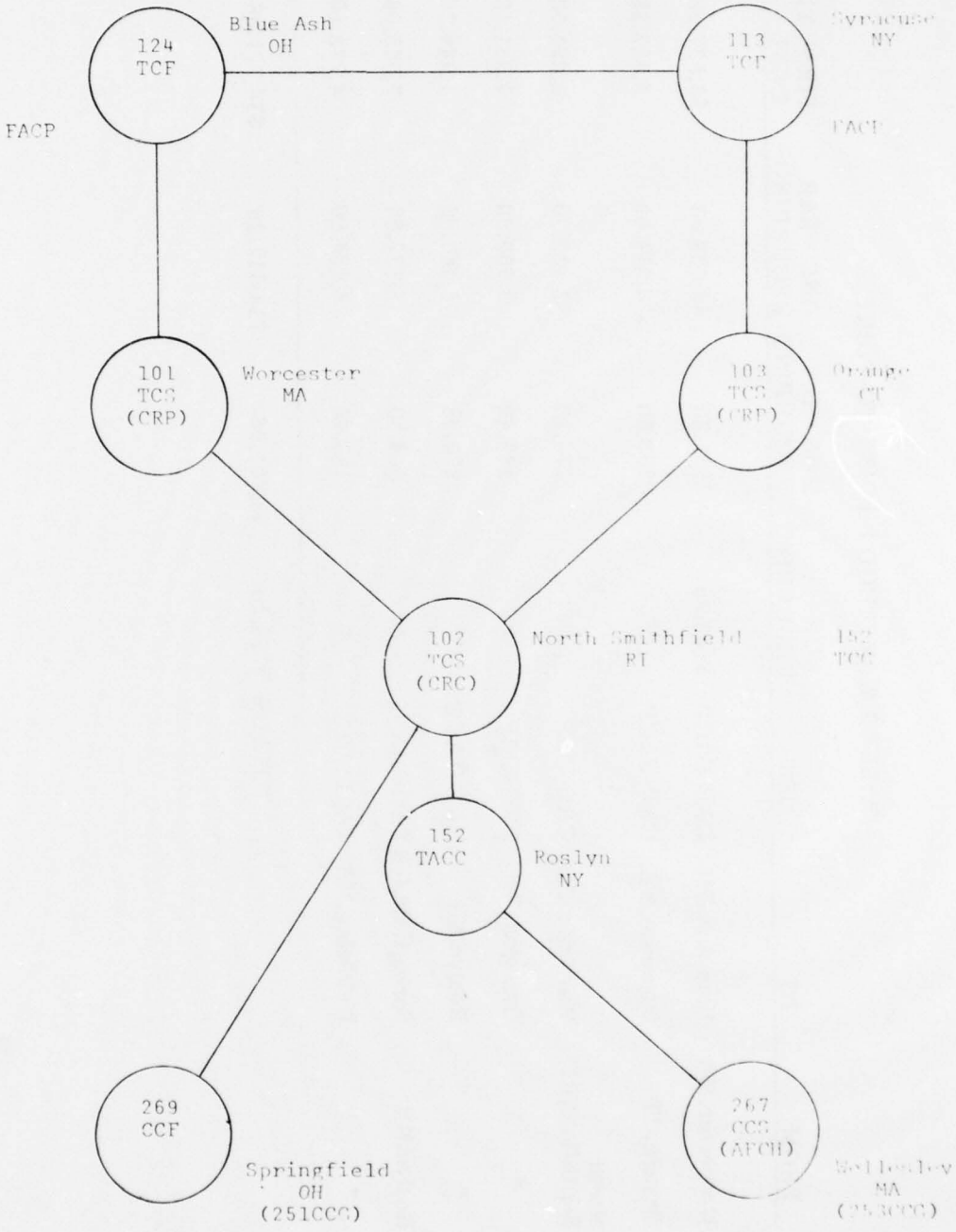


FIGURE 3-3. LARGE NET (TACTICAL CONTROL GROUP)

TABLE 3-2. METHOD I POINT-TO-POINT

FROM	TO	USE	NON-RECURRING	MONTHLY RECURRING	ONE YEAR RECURRING	FIRST YEAR COST
Worcester,MA	Blue Ash,OH	CRP-FACP	$108.30	$535.80	$6,429.60	$6,537.90
Orange,CT	Syracuse,NY	CRP-FACP	"	359.50	4,314.00	4,422.30
North Smithfield,RI	Worcester,Ma	CRC-CRP	"	176.10	2,113.20	2,221.50
" "	Orange,CT	CRC-CRP	"	329.40	3,952.80	4,061.10
" "	Roslyn,NY	CRC-TACC	"	370.08	4,440.96	4,549.26
Roslyn,NY	Springfield,OH	TACC-CCG	"	644.80	7,737.60	7,845.90
" "	Wellesley,MA	TACC-CCG	"	385.40	4,624.80	4,733.10
		TOTALS:	$758.10	$2,801.08	$33,612.96	$34,371.06

TABLE 3-3. METHOD II SMALL NET

FROM	TO	USE	NON-RECURRING	MONTHLY RECURRING	ONE YEAR RECURRING	FIRST YEAR COST
N.Smithfield,RI	Worcester,MA Orange,CT	CRC-CRP-CRP	$216.60	$ 426.45	$ 5,117.40	$ 5,334.00
Worcester,MA	Blue Ash,OH	CRP-FACP	108.30	535.80	6,429.60	6,537.90
Orange,CT	Syracuse,NY	CRP-FACP	208.30	359.50	4,314.00	4,422.30
N.Smithfield,RI	Roslyn,NY Springfield,OH Wellesley,MA	CRC-TACC-CCG-CCG	324.90	1,165.40	13,984.80	14,309.70
		TOTALS:	$758.10	$2,487.15	$29,845.80	$30,603.90

TABLE 3-4. METHOD III LARGE NET

N.Smithfield,RI	Worcester,MA Orange,CT Blue Ash,OH Syracuse,NY	CRC-CRP- FACP-FACP	$433.20	$1,221.51	$14,658.12	$15,091.32
N.Smithfield,RI	Roslyn,NY Springfield,OH Wellesley,MA	CRC-TACC- CCG-CCG	324.90	1,165.40	13,984.80	14,309.70
		TOTALS:	$758.10	$2,386.91	$28,642.92	$29,401.02

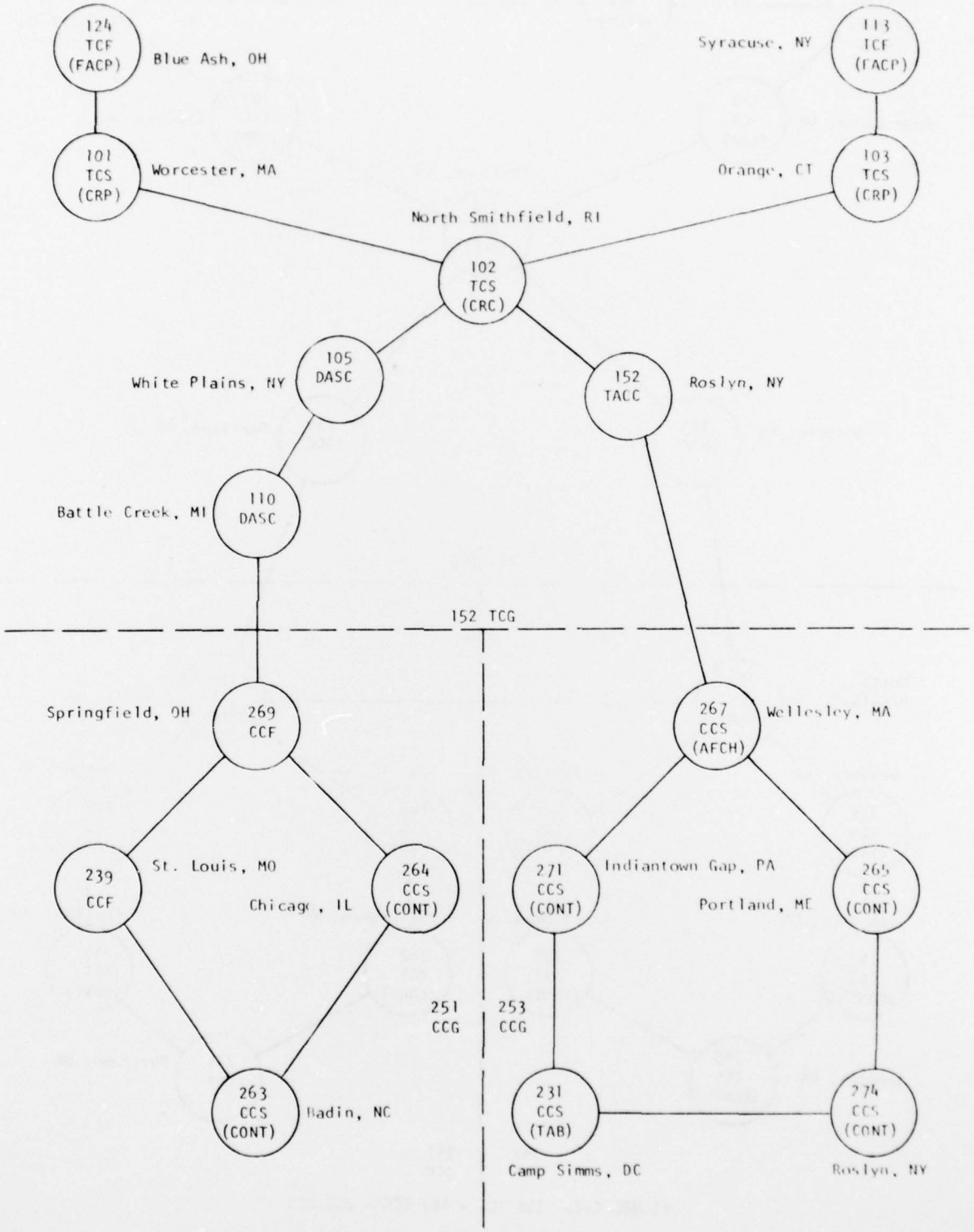


FIGURE 4-1. 152 TCG - 251 CCG - 253 CCG

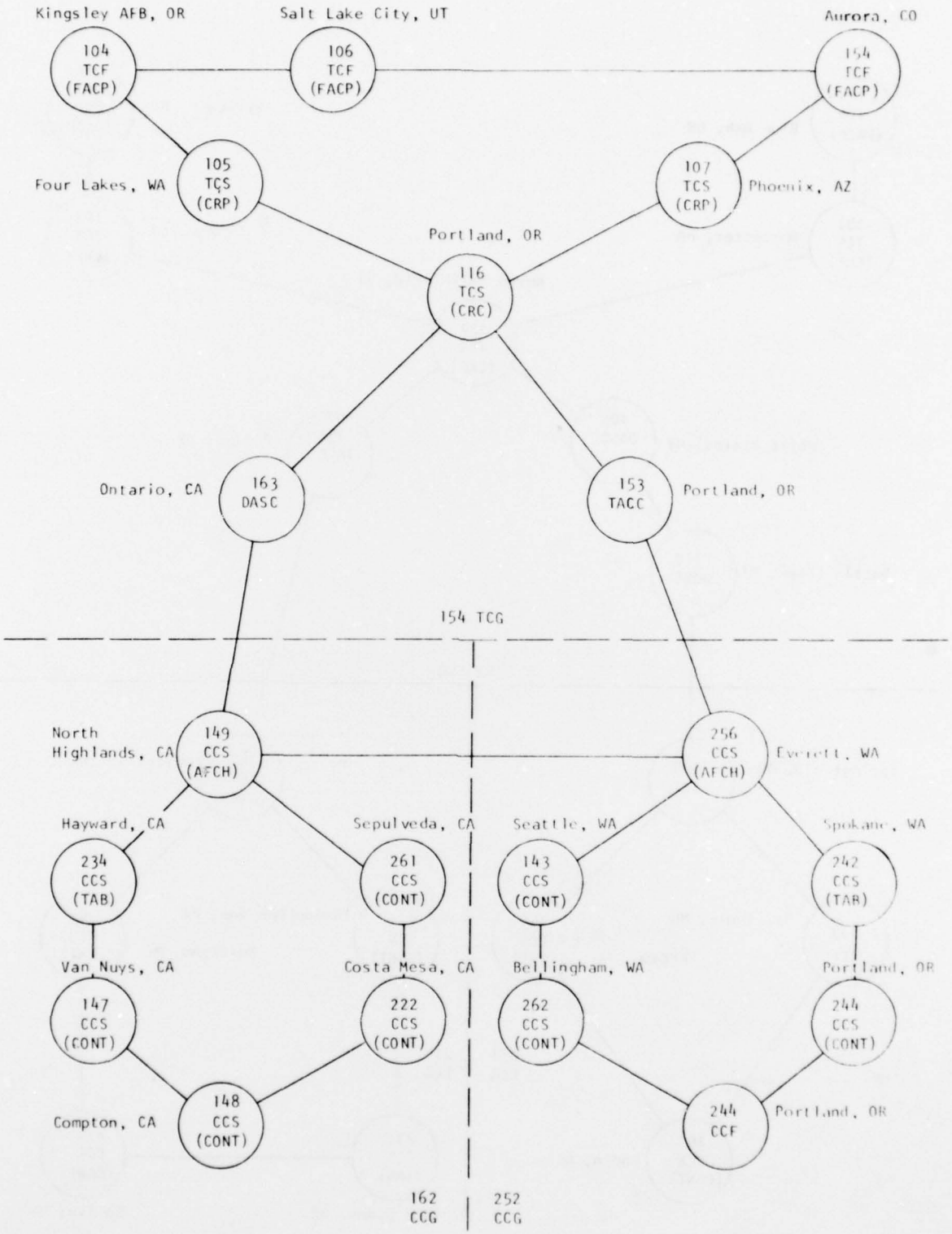
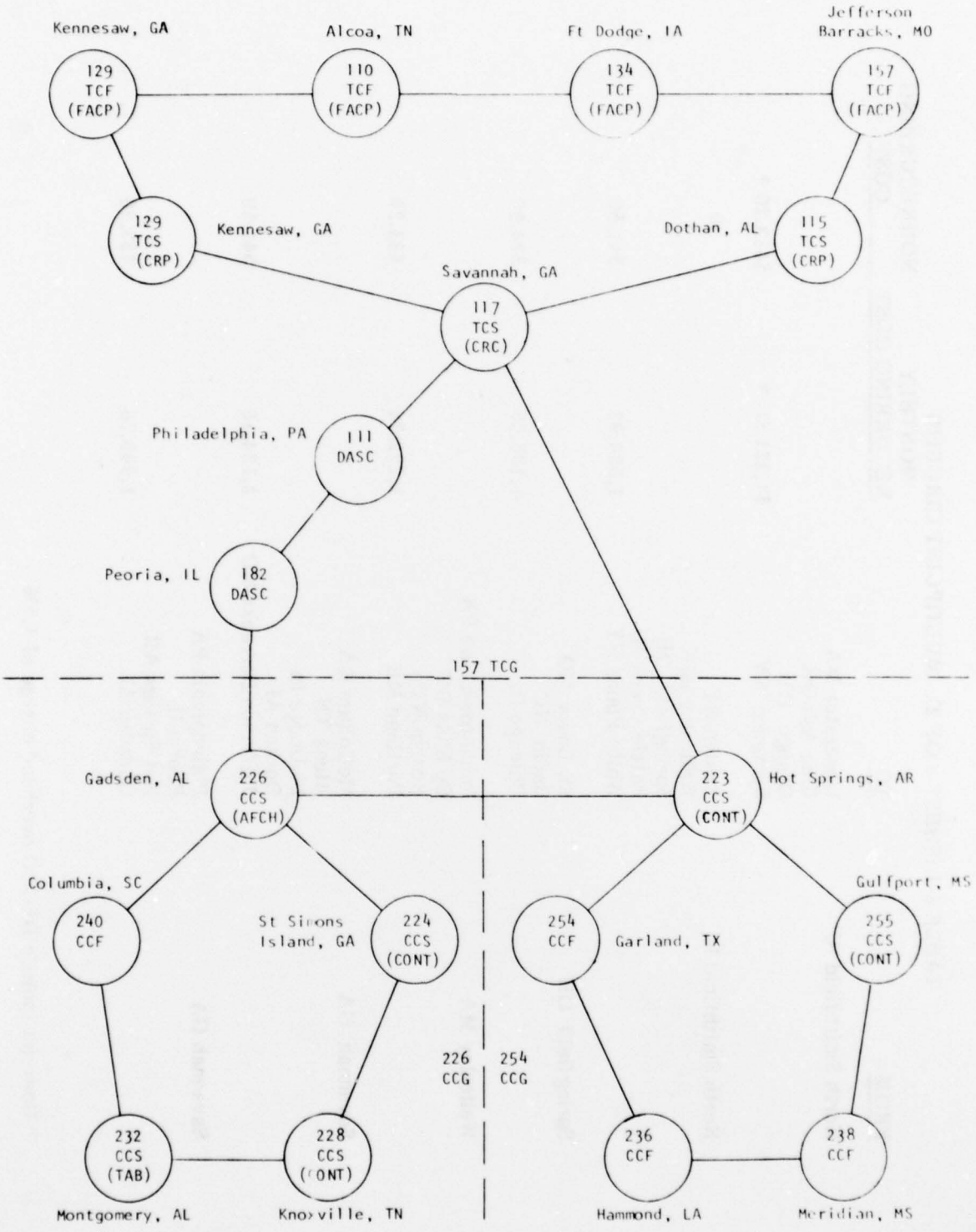


FIGURE 4-2. 154 TCG - 162 CCG - 252 CCG



F GURE 4-3. 157 TCG - 226 CCG - 254 CCG

TABLE 4-1 (SHEET 1 OF 2). MULTIPOINT CIRCUITS

FROM	TO	MONTHLY RECURRING COST	NONRECURRING COST
North Smithfield RI	Worcester MA Blue Ash OH Orange CT Syracuse NY	$1,221.51 *	$433.20 *
North Smithfield RI	Roslyn NY Wellesley MA Springfield OH Battle Creek MI White Plains NY	1,684.92	541.50
Springfield OH	St. Louis MO Badin NC Chicago IL	1,195.26	324.90
Wellesley MA	Indiantown Gap PA Cp Sims DC Roslyn NY Portland ME	1,222.74	433.20
Savannah GA	McCollum GA Alcoa TN Ft Dodge IA Dothan AL Jefferson Barracks MO	2,124.16	541.50
Savannah GA	Philadelphia PA Peoria IL Hot Springs AR Gadsden AL	1,949.76	433.20

* Does not include DECCO overhead charge of 1.5%

TABLE 4-1 (SHEET 2 OF 2). MULTIPOINT CIRCUITS

FROM	TO	MONTHLY RECURRING COST	NONRECURRING COST
Hot Springs AR	Garland TX Hammond LA Meridan MS Gulfport MS	$930.84	$324.90
Gadsden AL	Columbia SC Montgomery AL Knoxville TN St Simons Island GA	1,22.10	433.20
Portland OR	Four Lakes WA Klamath Falls OR Salt Lake City UT Phoenix AZ Cold Springs CO	2,587.48	541.50
Portland OR	Ontario CA Everett WA North Highlands CA	1,603.66	324.90
Everett WA	Spokane WA Portland OR Bellingham WA Seattle WA	1,143.85	433.20
North Highlands CA	Hayward CA Van Nuys CA Compton CA Costa Mesa CA Sepulveda CA	943.37	541.50

4.1. First year costs are as follows:

Annual Charges	$213.955.80	
Installation Charges (Telephone Co.)	5,306.70	
Subtotal:	$219,262.50	(Table 4-1)
DECCO Overhead (1-1/2 %)	3,288.94	
AN/TCC-29s (60 @ $463)	27,780.00	
TOTAL FIRST YEAR COST:	$250,331.44	

4.2. Costs in subsequent years should be as follows:

Annual Charges	$213,955.80
DECCO Overhead (1-1/2 %)	3,209.34
TOTAL SUBSEQUENT YEAR COSTS:	$217,165.14

5. RECOMMENDATIONS.

5.1 The Large Net circuitry (Table 4-1) is recommended for selection and use by the Air National Guard Tactical Control/Combat Communications Group to satisfy dedicated training circuit requirements.

5.2 AFM 100-18 programing action to obtain voice plus teletype equipment, specifically AN/TCC 29. If more teletype traffic capacity should be needed, the first year costs for commercial voice plus teletype equipment would be increased by $49,920 (two channels), $83,520 (three channels), or $110,520 (four channels).

*MFR, 1842 EEG/EETDD, 8 Sep 78.

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